This Page Is Inserted by IFW Operations
and is not a part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: 0 386 428
A2

(12) **EUROPEAN PATENT APPLICATION**

(21) Application number: 90101392.0

(51) Int. Cl.5: F16L 58/04

(22) Date of filing: 24.01.90

(30) Priority: 26.01.89 IT 1920589

(43) Date of publication of application:
12.09.90 Bulletin 90/37

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IT LI NL SE

(71) Applicant: ASSOTUBI ECOLOGICA S.r.l.
Via Fiume, 28
I-22044 Inverigo, Como(IT)

(72) Inventor: Bosisio, Sergio
Via Fiume, 28
I-22044 Inverigo, Como(IT)

(74) Representative: Riccardi, Sergio
Riccardi & Co. Via Macedonio Melloni, 32
I-20129 Milano(IT)

(54) **Process and equipment for lining concrete pipes.**

(57) This invention relates to a process and relative equipment for lining concrete pipes, particularly pipes for sewer systems.
The object of this lining, consisting of bisphenolic, isophthalic or similar resin, which impregnate a layer of single thread glass fibre cloth and antiacidic cloth, is to protect the pipe from corrosive acidic agents, including the socket connections between one section of the pipe and the next.

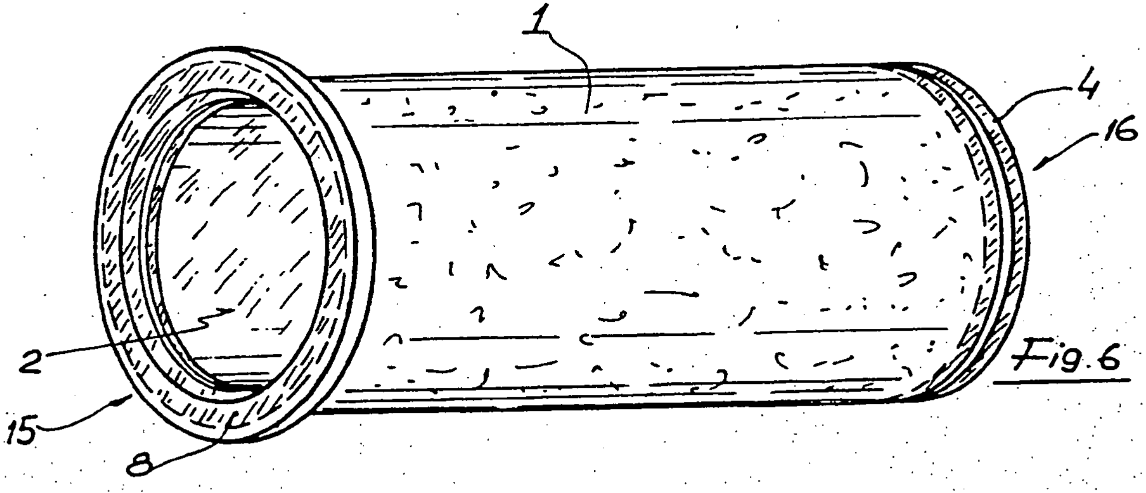


Fig. 6

PROCESS AND EQUIPMENT FOR LINING CONCRETE PIPES

This invention relates to a process and the relative equipment by which turbocentrifuged or vibrated concrete pipes can be lined with single thread glass fibre and anti-acid cloth impregnated with isophthalic bisphenolic resins and the like, the said pipes being traditionally used for carrying sewage or other highly acid substances and for irrigation and pressurised water pipelines.

It is known that pipes and headers in turbocentrifuged radially prestressed concrete or vibrated concrete are used to construct pipelines for sewage or acidic liquids.

These pipes are connected to male-female sockets and a layer of tarry material is usually applied on the inside with the aim of protecting the bed on which the sewage flows from the corrosive agents contained in the sewage and, above all, protecting the pipe from the corrosion caused by the highly acidic fumes and vapours which are generated inside the pipes which are generally buried at a certain depth.

Obviously, these pipes are irremediably damaged after a certain time and have to be replaced, which is a very expensive operation.

This invention eliminates this disadvantage since each section of pipe is lined in advance with a layer of glass fibre and anti-acid cloth impregnated with bisphenolic resin or a similar substance. In practice, this lining is effected by means of a tubular metal element inserted in the pipe of concrete, having an internal diameter which permits the element to carry a layer of lining of the thickness required for the lining of the pipe.

Subsequently, the lining is impregnated by the injection of bisphenolic resins which solidify in the air, leaving a perfectly smooth surface which provides maximum protection against acids and facilitates the flow of the liquid, almost totally eliminating decantation of the liquid.

These and other characteristics are explained more clearly in the following detailed description which is a purely non-limiting example of the scope of the invention, and from the various figures of the attached illustrative drawings, in which:

Figure 1 shows a side view of a section of concrete pipe traditionally used for the construction of sewage or acid liquid pipelines;

Figure 2 shows a highly enlarged cross section of the profile of the two ends of an element of sewer piping, showing the socket coupling between one section and the next;

Figure 3 shows a perspective view of the die, showing the elements which compose the anti-acid lining, applied on the outside by binding;

Figure 4 shows an enlarged detail of the die, showing the sector which moves on an inclined plane having the function of expanding and contracting the die internally to permit the detachment and uncoupling after the resins which have been injected have dried;

Figure 5 shows a complete side view of a pipe prepared for the injection of bisphenolic resin;

Figure 6 shows a complete perspective view of a section of piping line according to the process in question;

Figure 7 shows a schematic cross section of a coupling of two concrete pipes lined according to this invention;

Figure 8 shows a schematic cross section demonstrating a detail of the male flanging used for the lining of the pipe header, according to a variant of the invention;

Figure 9 shows a cross sectional view demonstrating a detail of the female flanging used for the lining of the socket header of the pipe, according to a variant of the invention; and

Figure 10 shows a view of an assembly in cross section, demonstrating the coupling between two pipes whose headers have been lined by means of the flanging, cited as variants to this invention and shown separately in figures 8 and 9.

Referring to the various figures of the attached drawings, the process in question provides for lining in advance of the pipes 1 in turbocentrifuged or vibrated concrete with a layer 2 of glass fibre impregnated with bisphenolic resin or a similar substance.

In addition to the inside walls 3, the lining will also extend to an external portion 4 of the male end 5 of the pipe and to the whole of the coupling seat 6 of the female flanging 7, including a small front circumferential portion 8.

This also provides protection for the seat 9 of the gasket 10 inside the flanged socket and the surrounding area which is notoriously subject to damage because of leakages of sewage and acidic gases.

In practice, a specific equipment 11 is used consisting of a tubular element 12 equipped with a mobile sector 13 operating between two inclined plane shoulders 14, acting as an expander which presses the glass fibre lining 2 uniformly against the internal walls of the concrete pipe 1 before and during the injection of the bisphenolic resins and, subsequently, permits the detachment of the tubular element from the joint and its withdrawal when the lining has dried.

The said die comprises two mobile flanging 15, 16 which will butt on the female flanged part 6 and the male end 5 of the concrete pipe.

The female flanging 15 also has the connections 17 for the injection of the bisphenolic resins and has an internal profile which is the reverse of the socket seat of the concrete pipe.

In operational terms, the die tube is prepared with a layer of binding 18 in anti-acid glass cloth 19, a layer of glass fibre 20, a pad and a final layer of glass cloth 21.

When this has been done, the die is inserted in the concrete pipe 1, counterflanged and after being correctly bedded and locked into position, bisphenolic resins or similar substances are injected enbloc.

After solidification, the longitudinal mobile sector 13 is released and the male counterflange is disconnected and the die is withdrawn.

When the process has been completed, the pipe has been provided with a lining 2 on the inside and on the headers of a given thickness which is extremely compact and smooth and is resistent to any acid agent.

According to a variant to this invention and referring to figures 8, 9 and 10, to provide a lining which is even more uniform in thickness and to avoid any leakage of the resin from the headers during injection at high pressure, special male 22 and female 23 flanges are used which reproduce the profile of the headers 5, 6 themselves and which have two circumferential gaskets 24 in order to obtain a perfect seal with the internal tubular die.

This also permits an improved profiling of the male and female terminal parts of the pipe lining to be obtained,\ guaranteeing that they fit together better with the extra aid of a perimetral gasket 10 inserted in a special seat 9 around the circumference of the pipes, as is provided for in the basic solution of this invention.

In addition, in this particular case, the tubes for the injection of the bisphenolic resin in the space between the concrete pipe and the die are located in the internal tubular element and not on the flanging of the headers.

The preceding detailed description makes it clear that this invention is the right solution to provide long lasting and resistant linings for concrete pipes for the construction of pipelines for sewers or highly acidic liquids.

Finally, it must be emphasised that the present embodiment does not limit the scope of the invention and that, on the contrary, numerous modifications, additions, variations or substitutions can be made to this invention without prejudice to the scope of its protection as defined in the claims attached hereto.

Claims

1. Process for lining concrete pipes characterised in that it essentially consists of the insertion of a tubular element into a section of pipe which acts as a support for the glass wool lining and as a die for the subsequent injection of bisphenolic, isophthalic or similar resin.

2. Process according to claim 1, characterised in that the said lining consists of an anti-acid cloth, a pad of glass wool and a second anti-acid cloth which can subsequently be impregnated with bisphenolic, isophtholic or similar resin, in order to form a protective layer which is resistent to any type of acid agent.

3. Process according to claim 1, characterised in that the said die also has two flanged headers designed to act as counter-rabbets so that the seats of the male-female connections of the pipe in question can be lined en bloc.

4. Equipment for lining concrete pipes with the process of claims 1 - 3, characterised by the fact of comprising a tubular element provided with a longitudinal detachable sector and two mobile flanges which can butt in the flanging of the pipe to be lined and in the terminal male part.

5. Equipment according to claim 4, characterised in that the said longitudinal detachable sector interacts with two rabbets on an inclined plane acting as an expander to keep the lining pressed against the circumference of the inside wall of the concrete pipe during the injection of the bisphenolic, isophthalic or similar resin.

6. Equipment according to claim 4, characterised in that the detachable flange also permits the circumferential seat of the rabbet for the socket connection with gasket to be lined with plastic reinforced by glass fibre, in order to avoid damage caused by leakage of acidic liquid.

7. Equipment according to claim 4, and on the basis of a variant to the invention, characterised in that the header flanges can have a profile which enables a frontal rabbet connection with the internal tubular die in order to obtain a better male-female connection profile between the various pipe sections.

8. Equipment according to claim 7, characterised by the fact that the said flanging also comprises two circumferential gaskets which respectively butt in the internal die and the external part of the pipe, in order to obtain maximum seal against the leakage of the resin during injection under high pressure.

9. Process for lining concrete pipes, as previously described and as illustrated in the various figures of the drawings attached hereto, for the purposes specified above.

10. Equipment for lining concrete pipes, as previously described and as illustrated in the various figures of the drawings attached hereto, for the

purposes specified above.

11. Lining for concrete pipes, whenever obtained by the process of claims 1 - 3 and with the equipment of claims 4 - 6.

12. Concrete piping particularly for pipelines to be used for sewers, pressurised water or acidic liquids, whenever provided with a lining obtained by the process of claims 1 - 3 and with the equipment of claims 4 - 6.

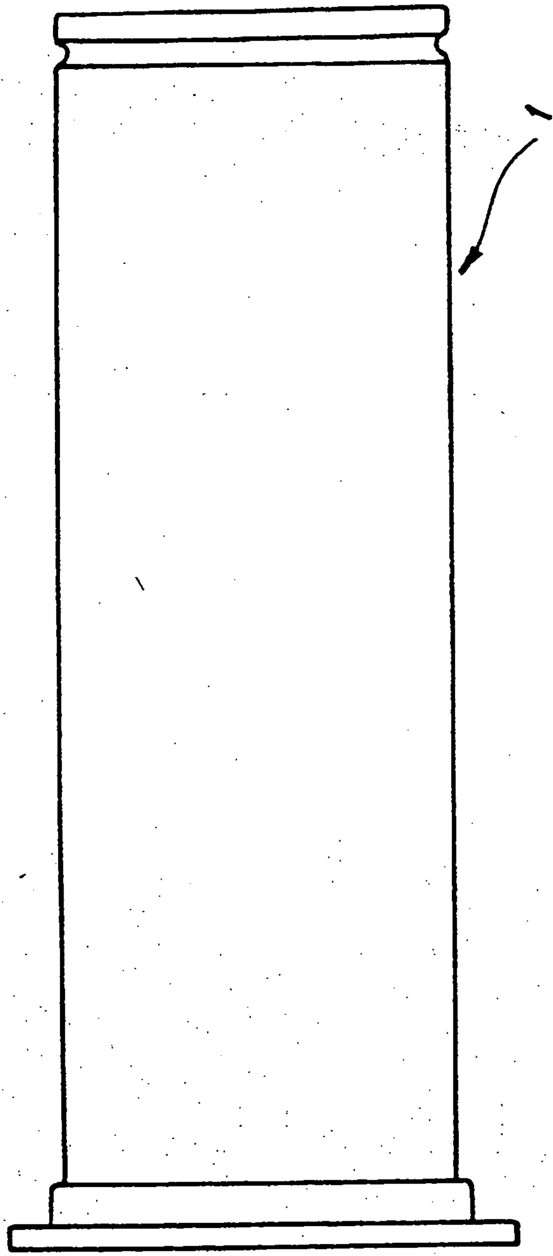


Fig. 1

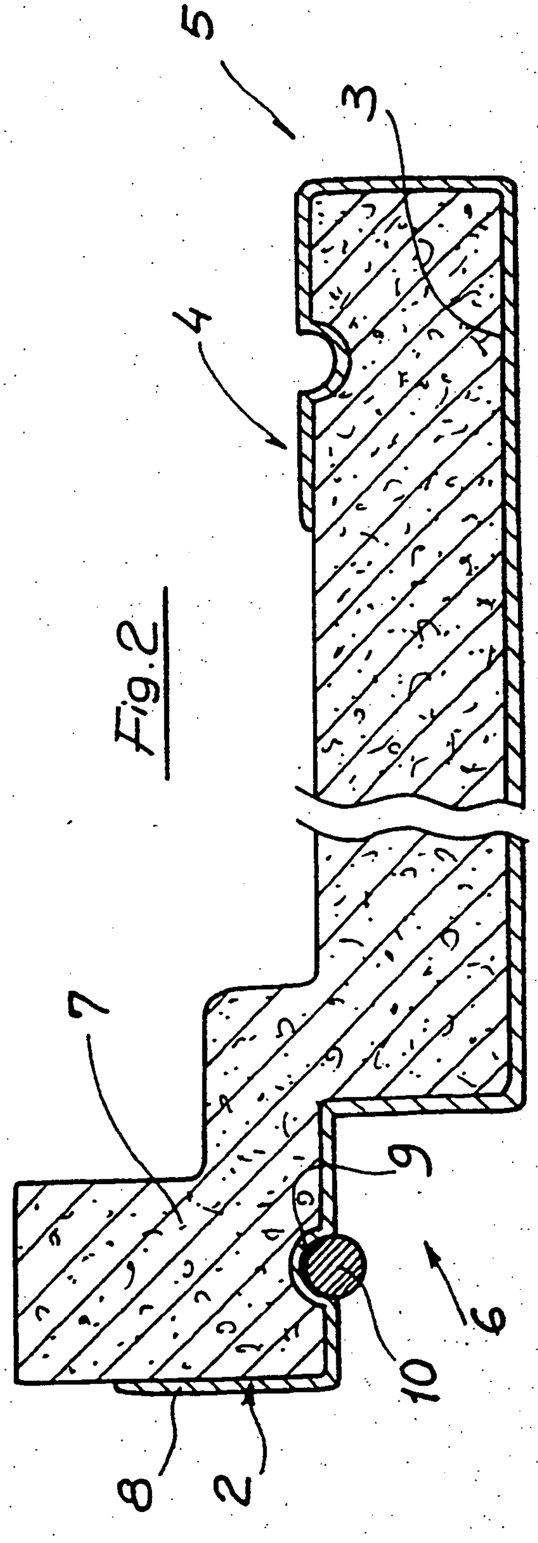


Fig. 2

Fig.3

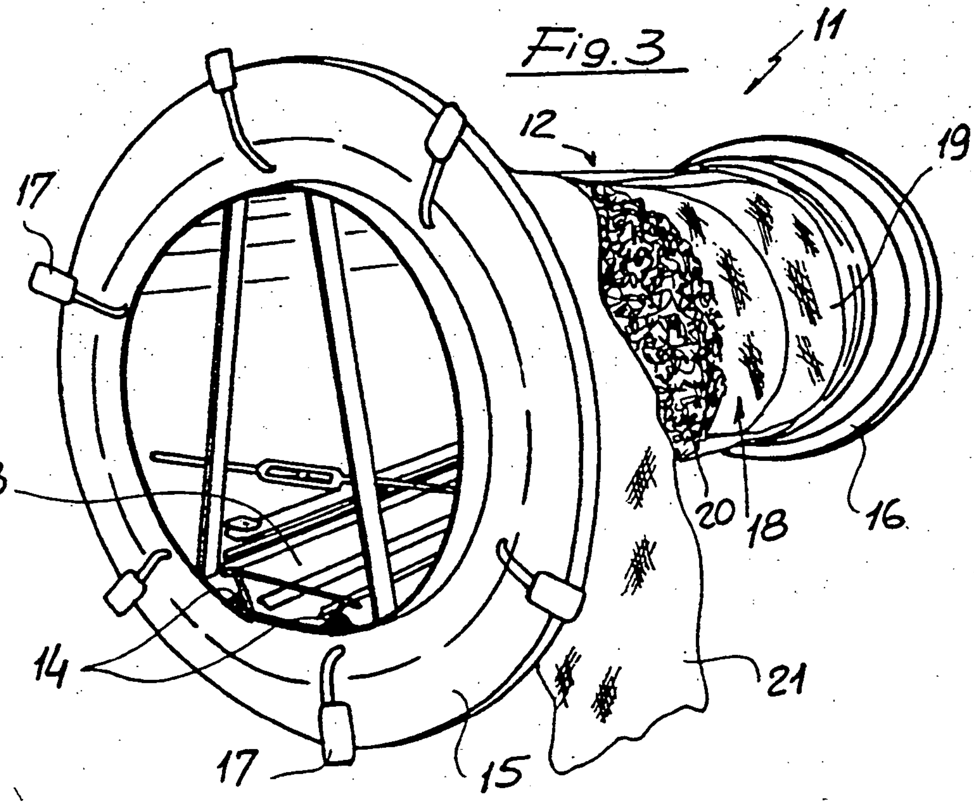
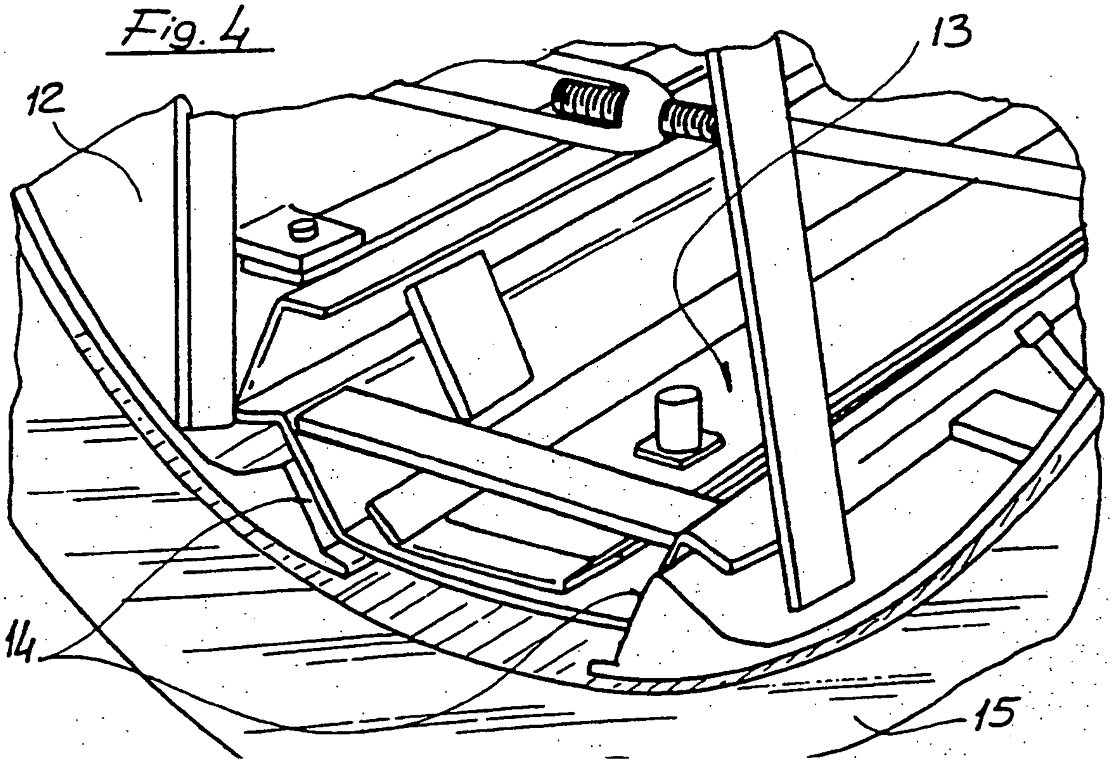


Fig. 4



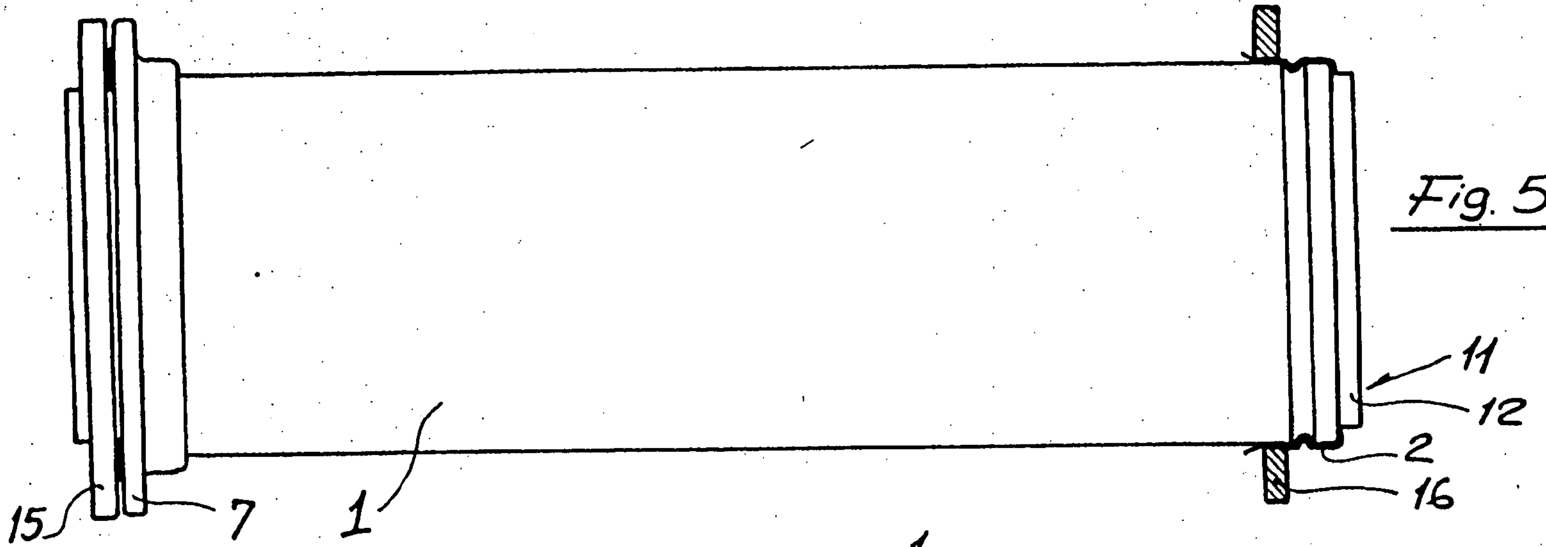


Fig. 5

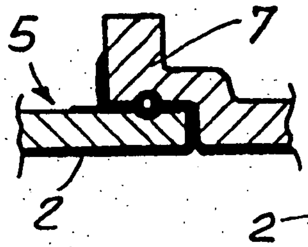


Fig. 7

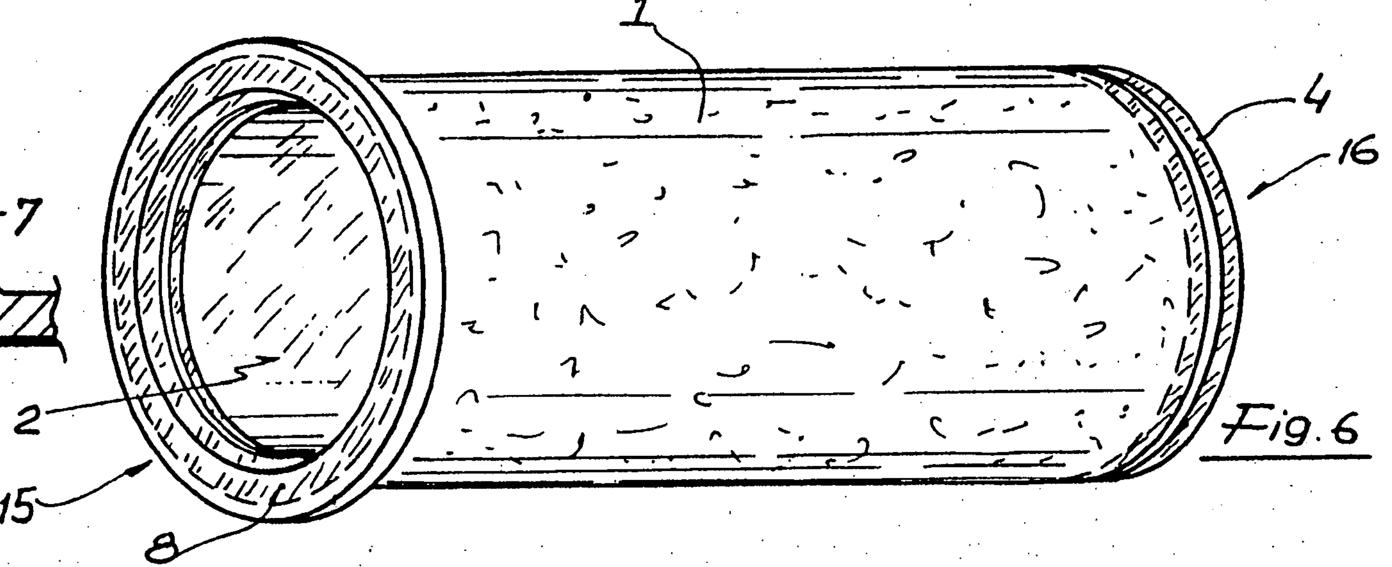


Fig. 6

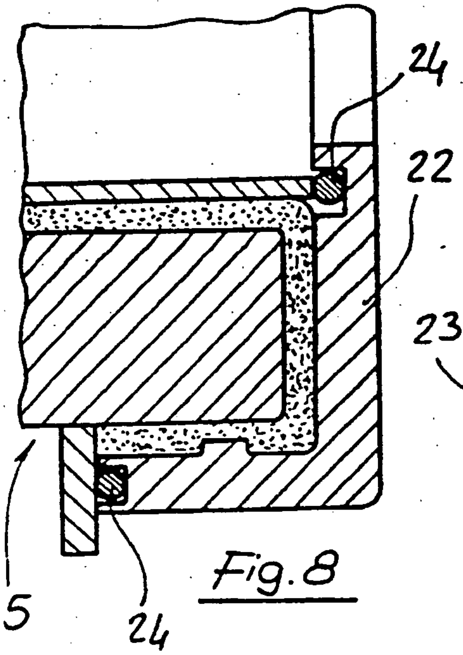


Fig. 8

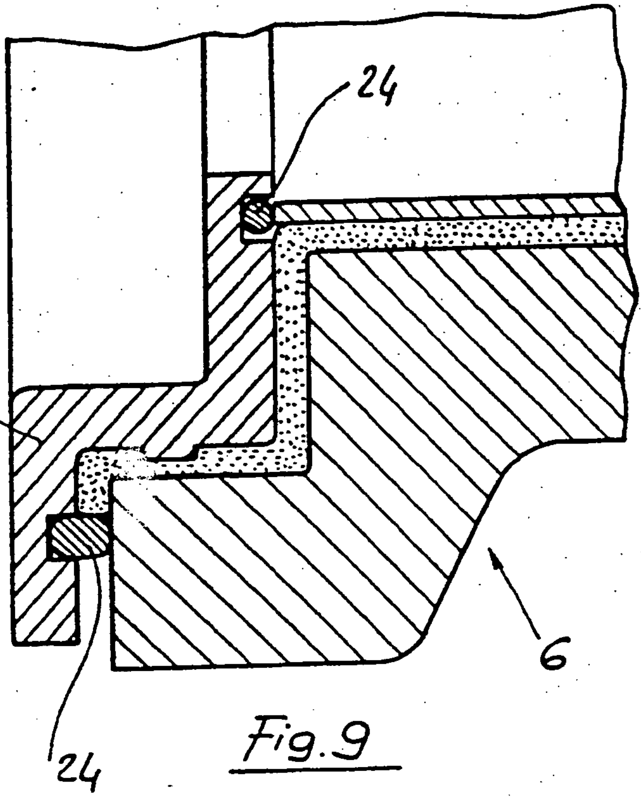


Fig. 9

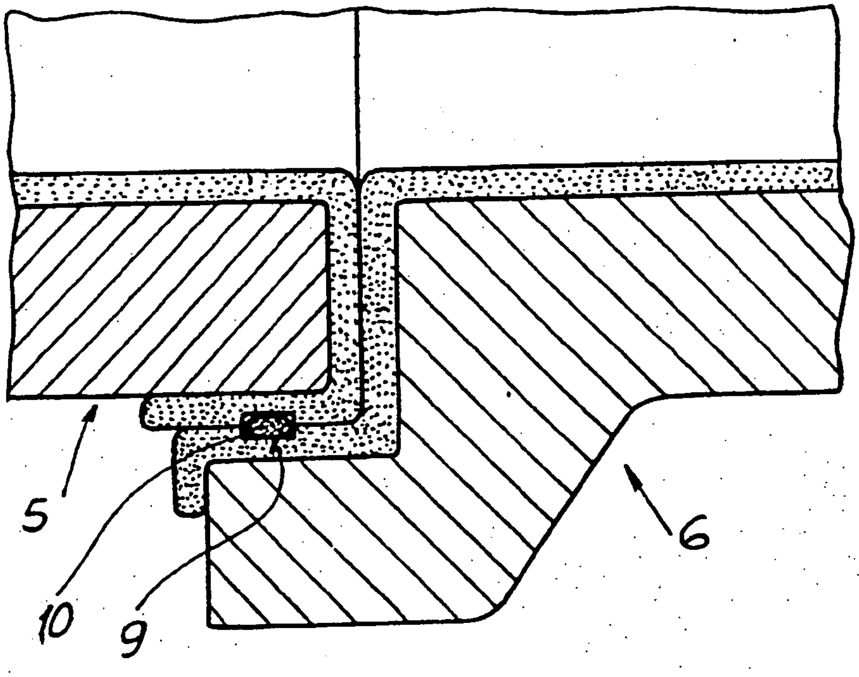


Fig. 10

⑲ Europäisches Patentamt
European Patent Office
Office européen des brevets

⑪ Publication number: **0 386 428 A3**

⑫ **EUROPEAN PATENT APPLICATION**

㉑ Application number: **90101392.0**

(51) Int. Cl.⁵: **F16L 58/04**

㉒ Date of filing: **24.01.90**

㉚ Priority: **26.01.89 IT 1920589**

㊸ Date of publication of application:
12.09.90 Bulletin 90/37

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IT LI NL SE

(88) Date of deferred publication of the search report:
11.12.91 Bulletin 91/50

(71) Applicant: **ASSOTUBI ECOLOGICA S.r.l.**
Via Fiume, 28
I-22044 Inverigo, Como(IT)

(72) Inventor: **Bosisio, Sergio**
Via Fiume, 28
I-22044 Inverigo, Como(IT)

(74) Representative: **Riccardi, Sergio**
Riccardi & Co. Via Macedonio Melloni, 32
I-20129 Milano(IT)

(54) **Process and equipment for lining concrete pipes.**

(57) This invention relates to a process and relative equipment for lining concrete pipes (1), particularly pipes for sewer systems.
The object of this lining, consisting of bisphenolic, isophthalic or similar resin, which impregnate a layer (2) of single thread glass fibre cloth and antiacidic cloth, is to protect the pipe from corrosive acidic agents, including the socket connections between one section of the pipe and the next.

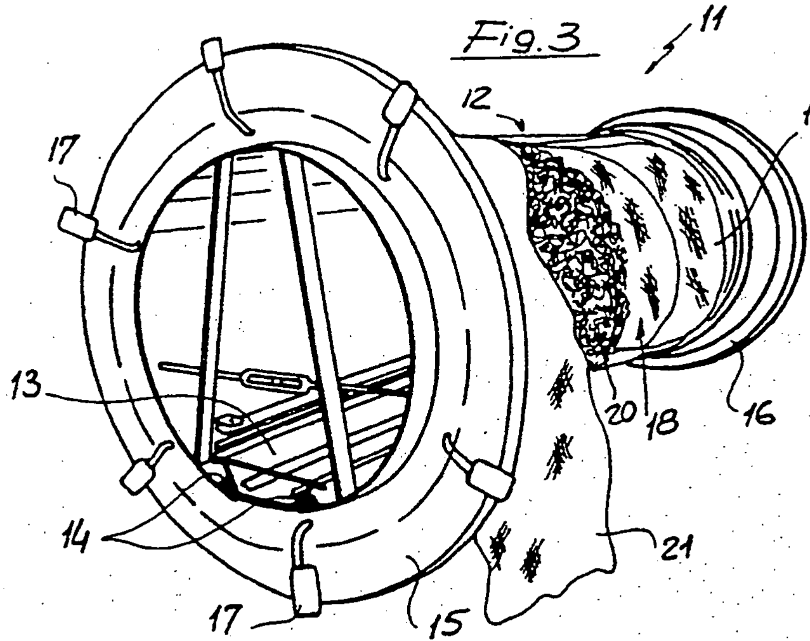


Fig.3

European
Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 10 1392

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y,A	DE-A-3 002 231 (KIESLING) * page 4, paragraph 1 - page 5, paragraph 1 * * figure 6 *	1,2,11,12	F 16 L 58/04
Y,A	GB-A-7 494 97 (HÜRNER) * page 1, line 43 - page 2, line 56 *	1,2,5,6,12	
P,A	DE-U-8 910 784 (FIRMA WALTER REINGER) * page 1, paragraph 1 - page 3, paragraph 3 *	1,3,4,6-8, 11,12	
A	PATENT ABSTRACTS OF JAPAN vol. 8, no. 30 (C-209)(1467) 8 February 1984, & JP-A-58 193770 (HATSUKOO K.K.) 11 November 1983, * the whole document *	1,2,8,11, 12	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

F 16 L
B 28 B
B 32 B

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
Berlin	30 September 91	RICHARDS T G

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
Y: particularly relevant if combined with another document of the same catagory
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention

E: earlier patent document, but published on, or after the filing date
D: document cited in the application
L: document cited for other reasons

&: member of the same patent family, corresponding document